**Fraud Detection System – Project Report**

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**Dataset Used:** creditcard.csv from Kaggle

# Objective

The objective of this project was to build a fraud detection system using the Credit Card Fraud Detection dataset. The system is designed to identify potentially fraudulent transactions by learning from historical data.

## Dataset and Preprocessing

1. We used the 'Credit Card Fraud Detection' dataset, which contains transactions made by European cardholders. The dataset is highly imbalanced, with only a small fraction of transactions being fraudulent.
2. To handle the class imbalance, we applied the SMOTE (Synthetic Minority Oversampling Technique) to oversample the minority class and balance the dataset

## Model Training and Evaluation

1. We selected the Random Forest Classifier for this project due to its ability to handle large datasets and its effectiveness in dealing with classification problems.
2. The model was trained on the balanced dataset (after SMOTE) and evaluated using common classification metrics such as precision, recall, F1-score, and accuracy.

## Problems Faced & Solutions

* **Problem:** The dataset was highly imbalanced, leading to poor performance on the minority class.

**Solution:** We used SMOTE to synthetically generate examples of the minority class.

* **Problem:** Gradient Boosting was computationally expensive and slow on Colab.

**Solution:** We replaced it with the Random Forest model which gave comparable results with significantly better speed.

* **Problem:** Manually entering 30 features for prediction was time-consuming.

**Solution:** We updated the interface to allow input of all 30 features in one line (didn’t modify this in the current code book).

## Results and Evaluation

The Random Forest model achieved high accuracy and performed well on evaluation metrics. The confusion matrix and classification report confirmed that the model was effective at identifying fraudulent transactions.

## 6. Conclusion

The fraud detection system is capable of effectively detecting fraudulent transactions. It is simple, lightweight, and can be tested via a command-line interface by entering transaction features.